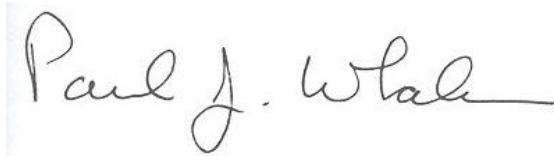


FOREWORD

While restoration of the Everglades involves several individual programs with various objectives, the Everglades Forever Act (373.4592, Florida Statutes) recognizes one of the cornerstones to improvement in the long-term ecological health of the Everglades is dependent on a strong and effective best management practices implementation program.

The purpose of this report is to provide a status report and verification of the on-going implementation of the Everglades Best Management Practices Program for the Everglades Agricultural Area as defined by Chapter 40E-63, Florida Administrative Code. Several constructive comments were received on the content and presentation of information in previous year's report. This report has incorporated all of the suggestions received and it is believed that the information in this report is presented in a clear and balanced manner.

This report provides a status update covering the period of May 1, 1997 through April 30, 1998 or Water Years 1998 (WY98).

A handwritten signature in dark ink, reading "Paul J. Whalen". The signature is written in a cursive, flowing style. The first name "Paul" is written in a larger, more prominent script, followed by "J." and then "Whalen". The signature is positioned on a light blue rectangular background.

Paul J. Whalen
Director – Everglades Regulation Division
Regulation Department
South Florida Water Management District

December 23, 1998

EXECUTIVE SUMMARY

The Everglades Best Management Practices (BMP) Program, mandated by State of Florida legislation, is one aspect of the South Florida Water Management District's Everglades Restoration Program. The goal of the BMP Program is a 25% annual total phosphorus reduction from the Everglades Agricultural Area as compared to a base period, October 1, 1978 – September 30, 1988 (pre-BMP implementation in the EAA). This report provides updated calculations for Water Year 1998 (May 1997 - April 1998).

The Everglades Forever Act specifically mandates a method to measure and calculate the annual EAA export of phosphorus in surface water runoff from the EAA lands (farms, cities, and industry). The methodology was developed during the 1991-1992 rulemaking effort to develop the Everglades Regulatory Program (Chapter 40E-63, F.A.C.).

In brief, the methodology compares the current year's measured phosphorus load in runoff attributable to the EAA farms, cities, and industry with BMPs in place, with a statistical prediction of what the phosphorus load would have been without the BMPs in place if the annual rainfall amount and monthly distribution measured for the *current* year had occurred during the pre-BMP period. The statistical prediction equation ($r^2=0.91$) was developed using the EAA measured loads and measured rainfall during a 10-year pre-BMP period. Each annual phosphorus percentage reduction is computed by comparing the *current* year's load with what the *predicted* average annual load of what the base period would have been had the *current* year's rainfall pattern occurred during the pre-BMP base period.

WATER YEAR 1998, EAA PHOSPHORUS MEASUREMENTS AND CALCULATIONS

LOAD:

ACTUAL WY98 EAA PHOSPHORUS MEASUREMENTS (WITH BMPs)	161 TONS
ESTIMATED WY98 PHOSPHORUS LOAD FROM THE EAA WITHOUT BMPs	244 TONS
WY98 PHOSPHORUS REDUCTION (RELATIVE DIFFERENCE)	34%
THREE YEAR TREND PHOSPHORUS REDUCTION WITH BMPs	55%

CONCENTRATION:

ACTUAL WY98 EAA PHOSPHORUS CONCENTRATION (WITH BMPs)	102 PPB
THREE YEAR TREND PHOSPHORUS CONCENTRATION WITH BMPs	100 PPB
AVERAGE PRE-BMP PERIOD (1979-1988) CONCENTRATION (W/O BMPs)	173 PPB

The trend of phosphorus load reduction represents a decrease of phosphorus from the combined surface water runoff attributable to the EAA farms, cities, and industry. **The calculation does not equate to a 55% reduction of the total phosphorus in surface water entering the Water Conservation Areas from the SFWMD operated pump stations and water control structures located at the EAA southern boundary.** The sum total of phosphorus entering the Water Conservation Areas through the SFWMD operated pumps and gates within the EAA originates from the combination of EAA surface water runoff, Lake Okeechobee releases (environmental, urban water supply, and regulatory), C-139 Basin surface water runoff, and stormwater treatment area discharges. The Water Conservation Area phosphorus inputs are as follows:

WATER YEAR 1998, PHOSPHORUS MEASUREMENTS TO WATER CONSERVATION AREAS FROM ALL SFWMD OPERATED STRUCTURES

209 TONS OF PHOSPHORUS WITH A COMBINED CONCENTRATION OF 109 PPB

- 144 tons directly from the EAA farms, cities, & industry
- 31 tons from C-139 Basin (of which 6 tons were passed through the EAA)
- 15 tons from Lake Okeechobee, passed through the EAA (environmental, urban water supply, and regulatory releases)
- 7.0 tons from L-28 Basin (pump station S-140)
- 7.0 tons from Feeder Canal Basin (structure S-190)
- 5.3 tons from C-11 West Basin (pump station S-9)
- 2.6 tons from STAs (outflow)

In addition to the Everglades BMP regulatory program, eighteen (18) research, implementation, and education BMP programs to reduce the discharge of phosphorus from the EAA have been underway since 1985. Of these programs, twelve (12) research activities have been the result of several partnerships between private sectors and public agencies (local, state, and federal). Four (4) of the research programs are currently on-going and are anticipated to continue through 2001 thus providing additional information to improve BMP implementation. Funding for these research partnerships have been provided by at least ten private and public entities totaling over \$8 million since 1985.

Water Year 1998 represents the third *full* water year of required best management practices (BMP) implementation throughout the EAA. As the number of annual calculations increase, the staff will be able to have increased confidence to quantify a specific level of long-term phosphorus reduction in the runoff attributable to BMPs. However, given the encouraging preliminary BMP program measurements and the performance of the initial SFWMD stormwater treatment areas (the ENR Project and STA-6), **there is increased confidence that the Everglades Forever Act's interim goal of achieving 50 ppb phosphorus concentration through the combination of existing landowner BMPs and downstream stormwater treatment areas will be met.**



TABLE OF CONTENTS

I. BACKGROUND

History of the Everglades Best Management Practices Program for the EAA.....	1
--	---

II. PERMITTING

Description of Permit Requirements	7
Description of Best Management Practices Plans	9
Description of Water Quality Monitoring Plans	12

III. POST PERMIT ACTIVITIES

Landowner Permit Best Management Practices	
BMP Spatial Distribution	13
BMP Verification	17
Landowner Permit Water Quality Monitoring	
Flow Calibration	20
Water Quality Data Submittals.....	21
Water Quality Annual Reports	22
Water Quality Monitoring Quality Assurance Field Audits.....	23

IV. EAA BASIN PHOSPHORUS MONITORING (SFWMD)

EAA Basin Results	29
EAA Basin Phosphorus Calculation Methodology	30
EAA Basin Annual Phosphorus Measurements and Calculations	35
BMP Research Partnerships and Funding	42
Status of Phosphorus Inflows from Everglades Construction Project Tributaries ...	46
Conclusions	47

V. WATER YEAR 1998 (WY98) LANDOWNER PHOSPHORUS MONITORING

WY98 Landowner Total Phosphorus Frequency & Spatial Distribution	51
WY98 Phosphorus Data Sorted by Permit Basin	57
WY98 Phosphorus Data Sorted by Concentration	65
WY98 Phosphorus Data Sorted by Load	73
WY98 Phosphorus Data Sorted by Percent Reduction	79

LIST OF FIGURES

Figure 1.	Tributary Basins to the Everglades.....	2
Figure 2.	SFWMD Water Control Structures within the 40E-63 Boundaries.....	3
Figure 3.	Landowner Water Control Structures within the 40E-63 Boundaries.....	4
Figure 4.	Spatial Location of Early and Non-Early Baseline Permit Boundaries.....	8
Figure 5.	Location of Basic Fertilizer Best Management Practices Implemented in the EAA	13
Figure 6.	Location of Advanced Fertilizer Best Management Practices Implemented in the EAA	14
Figure 7.	Location of Detention Best Management Practices Implemented in the EAA	14
Figure 8.	Location of Sediment Control Best Management Practices Implemented in the EAA	15
Figure 9.	Location of Urban Best Management Practices Implemented in the EAA	15
Figure 10.	Location of Pasture Management Best Management Practices Implemented in the EAA	16
Figure 11.	Location of Infrastructure Improvement Best Management Practices Implemented in the EAA	16
Figure 12.	Location of WY95 BMP Field Verifications	18
Figure 13.	Location of WY96 BMP Field Verifications	18
Figure 14.	Location of WY97 BMP Field Verifications	19
Figure 15.	Location of WY98 BMP Field Verifications.....	19
Figure 16.	Example of the Non-Parametric Evaluation of QA Audit Split Samples Using a Percent Relative Difference Comparison	24
Figure 17.	Location of WY94 Monitoring Quality Assurance Field Audits	26
Figure 18.	Location of WY95 Monitoring Quality Assurance Field Audits	26

(List of Figures continued)

Figure 19.	Location of WY96 Monitoring Quality Assurance Field Audits	27
Figure 20.	Location of WY97 Monitoring Quality Assurance Field Audits	27
Figure 21.	Location of WY98 Monitoring Quality Assurance Field Audits	28
Figure 22.	Schematic of Total Phosphorus Inflows to the Water Conservation Areas from the Various SFWMD Controlled Structures EAA	31
Figure 23.	Rule 40E-63, F.A.C. Hydrologic Adjustment and Basin Compliance Mathematical Equations to Calculate Annual Phosphorus Reductions	33
Figure 24.	Comparison of Observed Annual Phosphorus Measurements and Predicted Measurements	34
Figure 25.	EAA Basin Total Phosphorus Load Calculated as per Criteria in Rule 40E-63, F.A.C.....	38
Figure 26.	EAA Basin Total Phosphorus Percent Reduction Calculated as per Criteria in Rule 40E-63, F.A.C.....	39
Figure 27.	Normalized View of EAA Basin Phosphorus Loads.....	40
Figure 28.	EAA Basin Total Phosphorus Concentration Trends Calculated as per Criteria in Rule 40E-63, F.A.C. (no rainfall adjustments).....	41
Figure 29.	Timeline comparison of Rule 40E-63 EAA phosphorus levels with BMP activities	43
Figure 30.	Measure of progress towards phosphorus reduction to the Water Conservation Areas through BMPs and STAs [presented in terms of percent of flow].....	49
Figure 31.	Frequency Distribution of WY98 Permit Drainage Basin Total Phosphorus Concentration Discharges.....	52
Figure 32.	Frequency Distribution of WY98 Permit Drainage Basin Total Phosphorus Load Discharges	52
Figure 33.	WY98 Spatial Distribution of Permit Drainage Basin Total Phosphorus Concentrations	53
Figure 34.	WY98 Spatial Distribution of Permit Drainage Basin Total Phosphorus Loads Discharged	55

LIST OF TABLES

Table 1.	Permits and Permit Modifications Issued	7
Table 2.	Summary of Early and Non-Early Baseline Permit Information	8
Table 3.	Best Management Practices Summary and "BMP Equivalent" Points	10
Table 4.	Example of "BMP Equivalent" Plans for Four Different Landowner Basins.....	11
Table 5.	Summary of BMP Field Verifications.....	17
Table 6.	Summary of Landowner Water Control Structure Calibrations.....	20
Table 7.	Summary of Water Quality Monitoring at Landowner Water Control Structures	21
Table 8.	Summary of Sampling Periods and Quality Assurance Follow-up.....	22
Table 9.	Action Steps Taken to Correct Quality Assurance Audit Deficiencies	25
Table 10.	Summary of Landowner Water Quality Monitoring Quality Assurance Audits	25
Table 11.	Summary of EAA Basin Total Phosphorus Calculations Conducted in Accordance with Procedures Specified in Rule 40E-63, F.A.C. and the Everglades Forever Act, 373.4592, F.S.	36
Table 12.	WY80 through WY98 EAA Basin Total Phosphorus Measurements and Calculations	37
Table 13.	EAA BMP Research Initiatives & Estimated Amount of Funds Expended	45
Table 14.	WY98 Permit Phosphorus Data Sorted by Permit Basin	57
Table 15.	WY98 Permit Phosphorus Data Sorted by Concentration	65
Table 16.	WY98 Permit Phosphorus Data Sorted by Load	73
Table 17.	WY98 Permit Phosphorus Data Sorted by Percent Reduction	79